

What is claimed is:

1. A method of depositing an ALD thin film, the method being performed using a thin film deposition apparatus comprising: a reactor comprising a wafer block disposed in a chamber, the wafer block which heats a loaded wafer to a  
5 predetermined temperature, a top lid which covers and seals the chamber, a showerhead disposed under the top lid and combined with the top lid such that the showerhead is electrically isolated from the top lid, the showerhead including first spray holes and second spray holes, through which a first reaction gas and a second reaction gas are respectively sprayed on the wafer; and one or more RF power  
10 supply units which supply RF power to only the showerhead or both the showerhead and the wafer block, the method comprising:

(S1) loading the wafer on the wafer block;

(S2) depositing the ALD thin film on the wafer;

(S3) unloading the wafer, on which the ALD thin film is deposited, from the  
15 wafer block;

(S4-1) loading a dummy wafer on the wafer block;

(S4-2) stabilizing the flow rates and the pressures of gases in the reactor by spraying only an inert gas or a mixture of the inert gas and a cleaning gas in the reactor;

(S4-3) supplying RF power to the showerhead so as to activate the cleaning gas and mostly removing a thin film deposited on a surface of the showerhead by using the activated cleaning gas;

(S4-4) unloading the dummy wafer from the wafer block;

(S4-5) repeating steps 4-1 through 4-4 at least once using new dummy  
25 wafers; and

(S5) purging the inside of the reactor.

2. The method of claim 1, wherein the thin film deposition apparatus further comprises a plurality of gas curtain holes disposed on lateral surfaces of the showerhead or the top lid, the gas curtain holes which spray the inert gas toward an  
30 inner wall of the reactor,

wherein step 2 is performed while a gas curtain is being formed around the inner wall of the reactor by spraying the inert gas via the gas curtain holes.

3. The method of claim 1, wherein the thin film deposition apparatus further comprises a plurality of gas curtain holes disposed on lateral surfaces of the showerhead or the top lid, the gas curtain holes which spray the inert gas toward an inner wall of the reactor,

5 wherein step 4-3 is performed while the cleaning gas is being sprayed via any one group of holes among the first spray holes, the second spray holes, and the gas curtain holes, and the inert gas is being sprayed via the remaining holes.

10 4. The method of claim 1, wherein in step 4-3, the RF power is discontinuously supplied to the showerhead to prevent the showerhead from overheating.

5 15 5. The method of claim 1, wherein the RF power supplied to the showerhead ranges from 300 W to 4500 W.

6. The method of claim 1, further comprising (S4'-3) supplying RF power to the wafer block so as to activate the cleaning gas and mostly removing a thin film deposited on a surface of the wafer block by using the activated cleaning gas, wherein step 4'-3 is performed during or after step 4-3.

20 7. The method of claim 6, wherein when step 4'-3 is performed after step 4-3, step 4'-3 is performed after a new dummy wafer is loaded on the wafer block.

25 8. The method of claim 6, wherein the RF power supplied to the wafer block ranges from 150 W to 2000 W.

9. The method of claim 6, further comprising (S6) adhering byproducts generated in step 4-3 and/or step 4'-3 to an inner surface of the reactor,

wherein step 6 comprises:

30 a first pre-coating step performed before the dummy wafer is loaded on the wafer block; and

a second pre-coating step performed after the dummy wafer is loaded on the wafer block.

10. The method of claim 1, wherein the ALD thin film is formed of one selected from the group consisting of  $\text{Al}_2\text{O}_3$ ,  $\text{HfO}_2$ , and  $\text{ZrO}_2$ .

11. The method of claim 1, wherein the cleaning gas is  $\text{BCl}_3$  gas or a mixture of an inert gas and  $\text{BCl}_3$  gas, and the inert gas is one of Ar gas and  $\text{N}_2$  gas.

12. The method of claim 11, wherein the  $\text{BCl}_3$  gas is supplied at a flow rate of 5 sccm to 1000 sccm, the inert gas is supplied at a flow rate of 5 sccm to 1000 sccm, and the inside of the reactor 100 is maintained under a pressure of about 2 Torr or less.

13. A method of depositing an ALD thin film, the method being performed using a thin film deposition apparatus comprising: a reactor comprising a wafer block disposed in a chamber, the wafer block which heats a loaded wafer to a predetermined temperature, a top lid which covers and seals the chamber, a showerhead disposed under the top lid and combined with the top lid such that the showerhead is electrically isolated from the top lid, the showerhead including first spray holes and second spray holes, through which a first reaction gas and a second reaction gas are respectively sprayed on the wafer; and one or more RF power supply units which supply RF power to only the showerhead or both the showerhead and the wafer block, the method comprising:

(S1) loading the wafer on the wafer block;

(S2) depositing the ALD thin film on the wafer;

(S3) unloading the wafer, on which the ALD thin film is deposited, from the wafer block;

(S3.5) reducing the temperature of the wafer block to be lower than when the ALD thin film is deposited;

(S4-1) loading a dummy wafer on the wafer block of which the temperature is reduced;

(S4-2) stabilizing the flow rates and the pressures of gases in the reactor by spraying only an inert gas or a mixture of the inert gas and a cleaning gas in the reactor;

(S4-3) supplying RF power to the showerhead so as to activate the cleaning gas and mostly removing a thin film deposited on a surface of the showerhead by using the activated cleaning gas;

(S4-4) unloading the dummy wafer from the wafer block;

5 (S4-5) repeating steps 4-1 through 4-4 at least once using new dummy wafers; and

(S5') raising the temperature of the wafer block to the same temperature as the temperature when the ALD thin film is deposited, while purging the inside of the reactor using the inert gas.

10 14. The method of claim 13, wherein the thin film deposition apparatus further comprises a plurality of gas curtain holes disposed on lateral surfaces of the showerhead or the top lid, the gas curtain holes which spray the inert gas toward an inner wall of the reactor,

15 wherein step 2 is performed while a gas curtain is being formed around the inner wall of the reactor by spraying the inert gas via the gas curtain holes.

20 15. The method of claim 13, wherein the thin film deposition apparatus further comprises a plurality of gas curtain holes disposed on lateral surfaces of the showerhead, the gas curtain holes which spray the inert gas toward an inner wall of the reactor,

wherein step 4-3 is performed while the cleaning gas is being sprayed via any one group of holes among the first spray holes, the second spray holes, and the gas curtain holes, and the inert gas is being sprayed via the remaining holes.

25 16. The method of claim 13, wherein in step 4-3, the RF power is discontinuously supplied to the showerhead to prevent the showerhead from overheating.

30 17. The method of claim 13, wherein the RF power supplied to the showerhead ranges from 300 W to 4500 W.

18. The method of claim 13, further comprising (S4'-3) supplying the RF power to the wafer block so as to activate the cleaning gas and mostly removing a

thin film deposited on a surface of the wafer block by using the activated cleaning gas, wherein step 4'-3 is performed during or after step 4-3.

19. The method of claim 18, wherein when step 4'-3 is performed after step 4-3, step 4'-3 is performed after a new dummy wafer is loaded on the wafer block.

20. The method of claim 18, wherein the RF power supplied to the wafer block ranges from 150 W to 2000 W.

21. The method of claim 18, further comprising (S6) adhering byproducts generated in step 4-3 and/or step 4'-3 to an inner surface of the reactor, wherein step 6 comprises:

a first pre-coating step performed before the dummy wafer is loaded on the wafer block; and

a second pre-coating step performed after the dummy wafer is loaded on the wafer block.

22. The method of claim 13, wherein the ALD thin film is formed of one selected from the group consisting of  $\text{Al}_2\text{O}_3$ ,  $\text{HfO}_2$ , and  $\text{ZrO}_2$ .

23. The method of claim 13, wherein the cleaning gas is  $\text{BCl}_3$  gas or a mixture of an inert gas and  $\text{BCl}_3$  gas, and the inert gas is one of Ar gas and  $\text{N}_2$  gas.

24. The method of claim 23, wherein the  $\text{BCl}_3$  gas is supplied at a flow rate of 5 sccm to 1000 sccm, the inert gas is supplied at a flow rate of 5 sccm to 1000 sccm, and the inside of the reactor 100 is maintained under a pressure of about 2 Torr or less.